



DIM600NSM45-F000

Single Switch IGBT Module

DS5873-1.1 February 2006 (LN24464)

FEATURES

- 10µs Short Circuit Withstand
- Soft Punch Through Silicon
- Lead Free construction
- Isolated MMC Base with AlN Substrates
- High Thermal Cycling Capability

APPLICATIONS

- High Reliability Inverters
- Motor Controllers
- Traction Drives
- Choppers

The Powerline range of high power modules includes half bridge, chopper, dual, single and bi-directional switch configurations covering voltages from 600V to 6500V and currents up to 3600A.

The DIM600NSM45-F000 is a single switch 4500V, soft punch through n-channel enhancement mode, insulated gate bipolar transistor (IGBT) module. The IGBT has a wide reverse bias safe operating area (RBSOA) plus 10µs short circuit withstand. This device is optimised for traction drives and other applications requiring high thermal cycling capability.

The module incorporates an electrically isolated base plate and low inductance construction enabling circuit designers to optimise circuit layouts and utilise grounded heat sinks for safety.

ORDERING INFORMATION

Order As:

DIM600NSM45-F000

Note: When ordering, please use the complete part number

KEY PARAMETERS

V_{CES} **4500V**

$V_{CE(sat)}$ * **(typ) 2.9 V**

I_C **(max) 600A**

$I_{C(PK)}$ **(max) 1200A**

*(measured at the power busbars and not the auxiliary terminals)

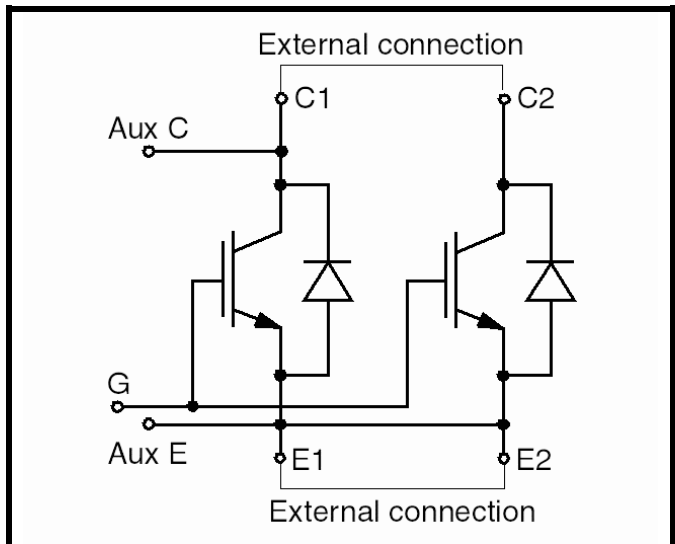


Fig. 1 Single switch circuit diagram

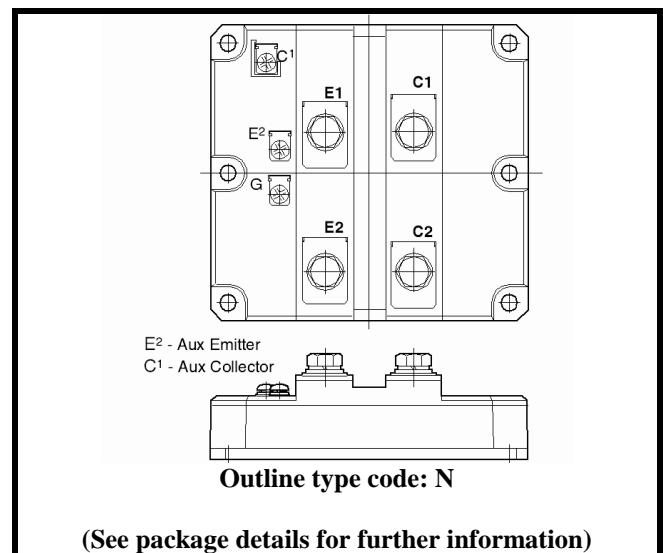


Fig. 2 Electrical connections - (not to scale)

ABSOLUTE MAXIMUM RATINGS

Stresses above those listed under 'Absolute Maximum Ratings' may cause permanent damage to the device. In extreme conditions, as with all semiconductors, this may include potentially hazardous rupture of the package. Appropriate safety precautions should always be followed. Exposure to Absolute Maximum Ratings may affect device reliability.

T_{case} = 25°C unless stated otherwise

Symbol	Parameter	Test Conditions	Max.	Units
V _{CES}	Collector-emitter voltage	V _{GE} = 0V	4500	V
V _{GES}	Gate-emitter voltage		±20	V
I _C	Continuous collector current	T _{case} = 100 °C	600	A
I _{C(PK)}	Peak collector current	1ms, T _{case} = 115 °C	1200	A
P _{max}	Max.transistor power dissipation	T _{case} = 25 °C, T _j = 150 °C	10.4	kW
V _{isol}	Isolation voltage-per module	Commoned terminals to base plate. AC RMS, 1 min, 50Hz	6000	kV
Q _{PD}	Partial discharge-per module	IEC1287. V ₁ = 3750V, V ₂ = 2750V, 50Hz RMS	10	pC

THERMAL AND MECHANICAL RATINGS

Internal insulation material:	AlN
Baseplate material:	AlSiC
Creepage distance:	29mm
Clearance:	20mm
CTI (Critical Tracking Index)	175

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
R _{th(j-c)}	Thermal resistance -transistor (per switch)	Continuous dissipation - junction to case		-	12	°C/kW
R _{th(j-c)}	Thermal resistance -diode (per switch)	Continuous dissipation - junction to case		-	24	°C/kW
R _{th(c-h)}	Thermal resistance -case to heatsink (per module)	Mounting torque 5Nm (with mounting grease)		-	8	°C/kW
T _j	Junction temperature	Transistor	-	-	150	°C
		Diode	-	-	125	°C
T _{stg}	Storage temperature range	-	-40	-	125	°C
	Screw torque	Mounting M6	-	-	5	Nm
		Electrical connections -M4	-	-	2	Nm
		Electrical connections -M8	-	-	10	Nm

ELECTRICAL CHARACTERISTICS

$T_{case} = 25^{\circ}\text{C}$ unless stated otherwise.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
I_{CES}	Collector cut-off current	$V_{GE}=0V, V_{CE}=V_{CES}$			1	mA
		$V_{GE}=0V, V_{CE}=V_{CES}, T_{case}=125^{\circ}\text{C}$			60	mA
I_{GES}	Gate leakage current	$V_{GE}=\pm 20V, V_{CE}=0V$			8	μA
$V_{GE(TH)}$	Gate threshold voltage	$I_C=80\text{mA}, V_{GE}=V_{CE}$	5.5	6.5	7.0	V
$V_{CE(sat)}^{\dagger}$	Collector-emitter saturation voltage	$V_{GE}=15V, I_C=600\text{A}$		2.9		V
		$V_{GE}=15V, I_C=600\text{A}, T_{VJ}=125^{\circ}\text{C}$		3.5		V
I_F	Diode forward current	DC			600	A
I_{FM}	Diode maximum forward current	$t_p=1\text{ms}$			1200	A
V_F	Diode forward voltage	$I_F=600\text{A}$		3.0		V
		$I_F=600\text{A}, T_{VJ}=125^{\circ}\text{C}$		3.1		V
C_{ies}	Input capacitance	$V_{CE}=25V, V_{GE}=0V, f=1\text{MHz}$		132		nF
C_{res}	Reverse transfer capacitance	$V_{CE}=25V, V_{GE}=0V, f=1\text{MHz}$		1.8		nF
L_M	Module inductance	--		15		nH
R_{INT}	Internal transistor resistance			135		$\mu\Omega$
SC_{Data}	Short circuit. I SC	$T_j \leq 125^{\circ}\text{C}, V_{CC} \leq 3000V, I_1$		2800		A
		$t_p=10\text{us}, V_{CE(max)}=V_{CES} - L^* \cdot di/dt$ IEC 60747-9 I_2		2500		A

Note:

† Measured at the power busbars and not the auxiliary terminals

* L is the circuit inductance + L_M

ELECTRICAL CHARACTERISTICS

T_{case} = 25°C unless stated otherwise

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
t _{d(off)}	Turn-off delay time	I _C = 600A V _{GE} = ±15V V _{CE} = 2250V R _{G(ON)} = 4.7Ω R _{G(OFF)} = 11Ω C _{ge} = 110nF L ~ 200nH		5.0		us
t _f	Fall time			250		ns
E _{OFF}	Turn-off energy loss			1500		mJ
t _{d(on)}	Turn-on delay time			850		ns
t _r	Rise time			220		ns
E _{ON}	Turn-on energy loss			1800		mJ
Q _g	Gate charge			20		uC
Q _{rr}	Diode reverse recovery charge	I _F = 600A, V _{CE} = 2250V, dI _F /dt = 3000A/us		475		uC
I _{rr}	Diode reverse recovery current			700		A
E _{rec}	Diode reverse recovery energy			600		mJ

T_{case} = 125°C unless stated otherwise

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
t _{d(off)}	Turn-off delay time	I _C = 600A V _{GE} = ±15V V _{CE} = 2250V R _{G(ON)} = 4.7Ω R _{G(OFF)} = 11Ω C _{ge} = 110nF L ~ 200nH		5.2		us
t _f	Fall time			250		ns
E _{OFF}	Turn-off energy loss			1700		mJ
t _{d(on)}	Turn-on delay time			800		ns
t _r	Rise time			220		ns
E _{ON}	Turn-on energy loss			2700		mJ
Q _{rr}	Diode reverse recovery charge	I _F = 600A, V _{CE} = 2250V, dI _F /dt = 3000A/us		850		uC
I _{rr}	Diode reverse recovery current			820		A
E _{rec}	Diode reverse recovery energy			1050		mJ

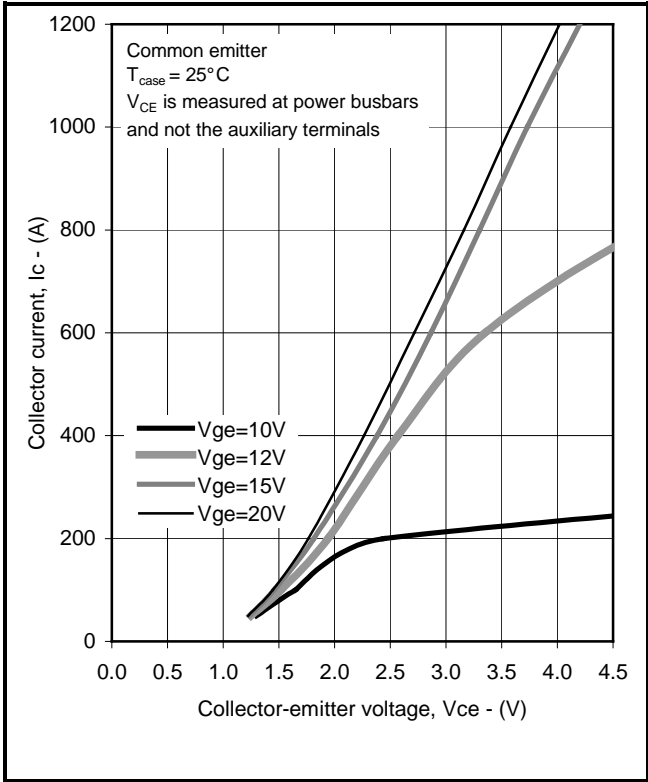


Fig. 3 Typical output characteristics

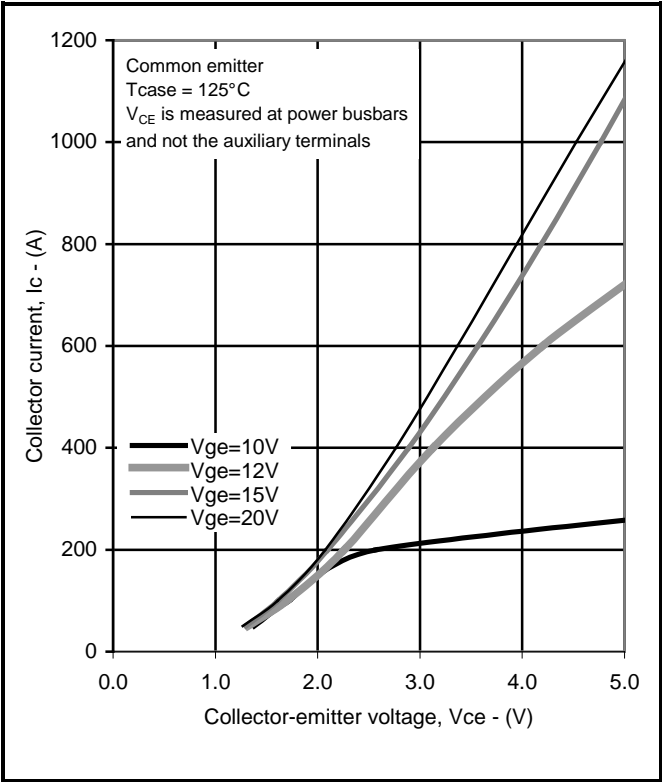


Fig. 4 Typical output characteristics

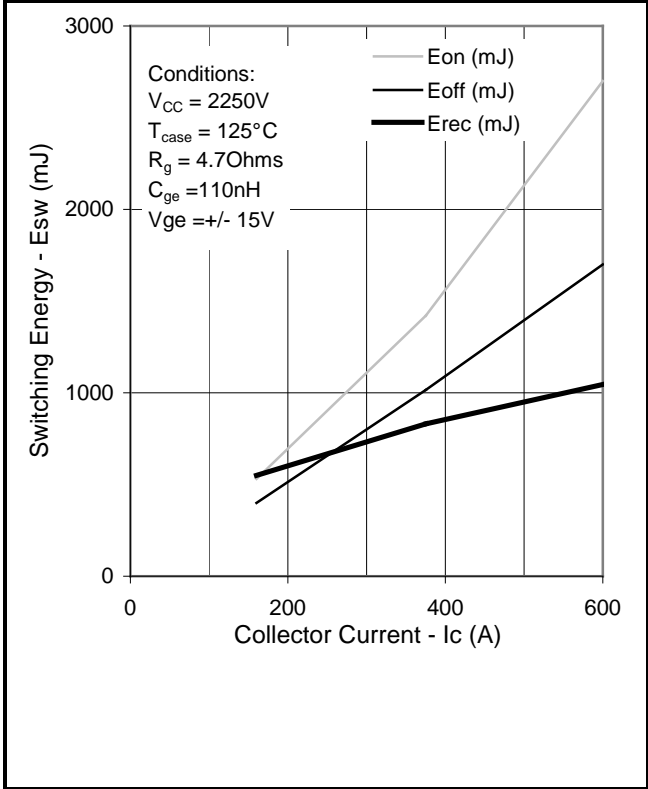


Fig.5 Typical switching energy vs collector current

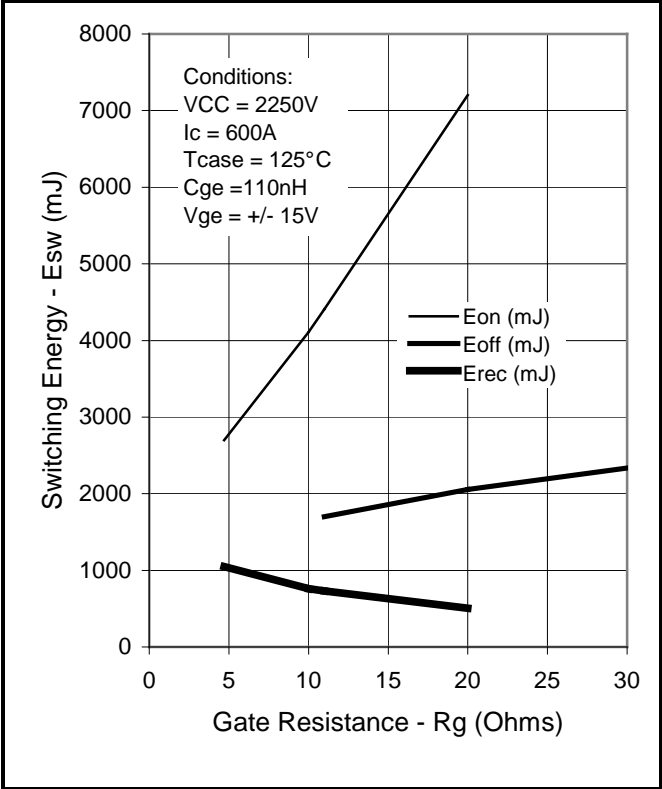


Fig. 6 Typical switching energy vs gate resistance

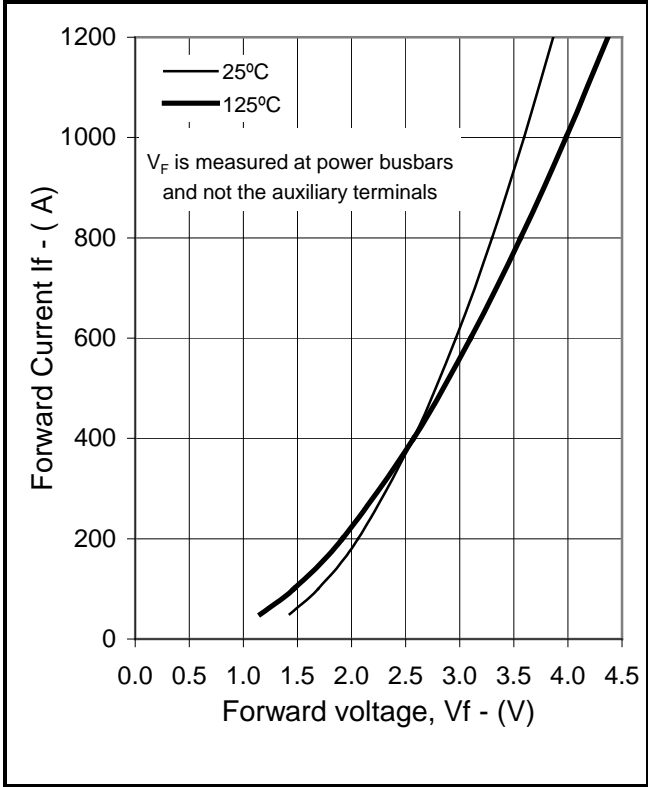


Fig. 7 Diode typical forward characteristics

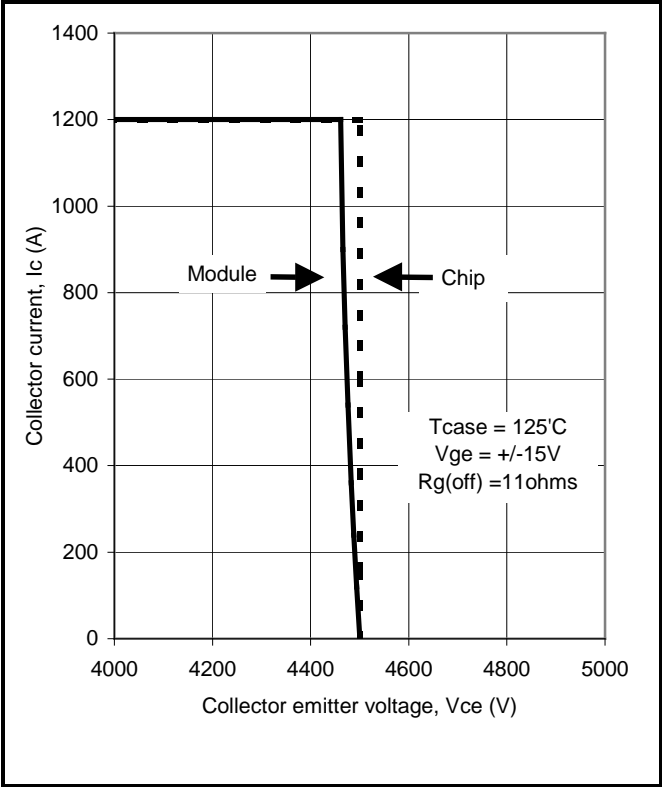


Fig. 8 Reverse bias safe operating area

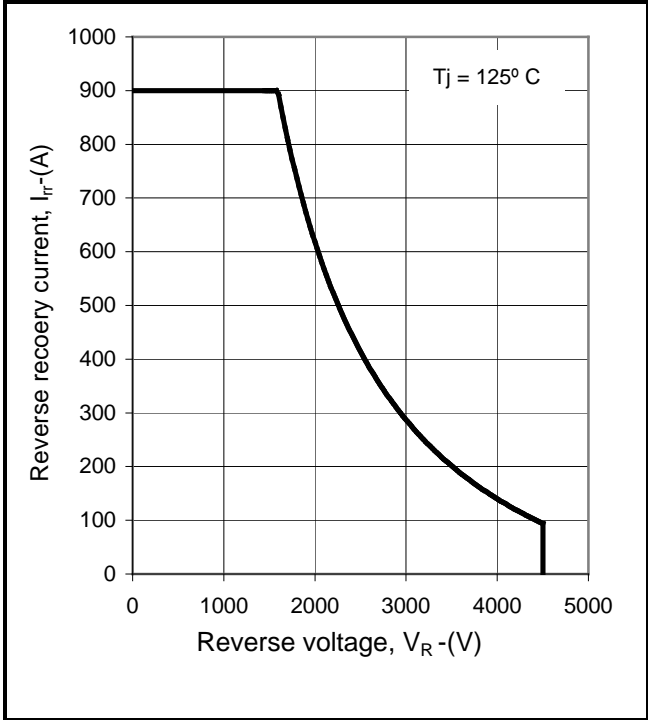


Fig. 9 Diode reverse bias safe operating area

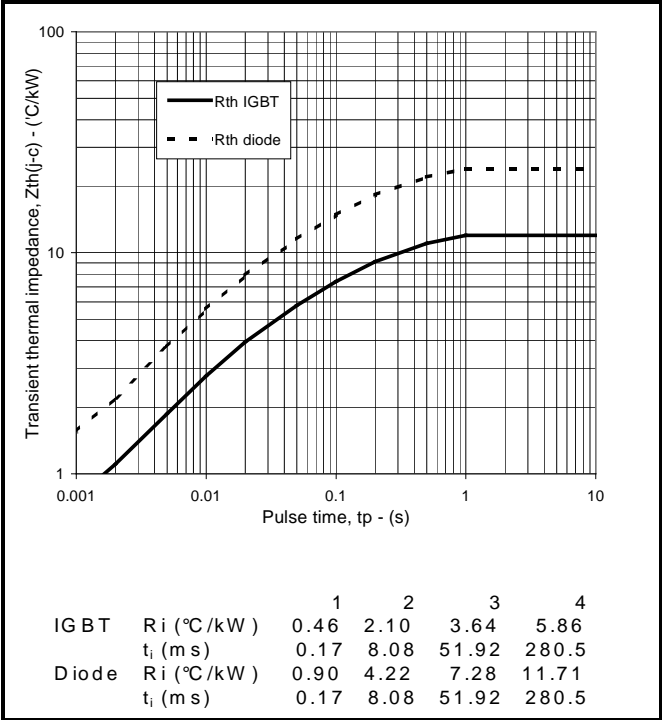
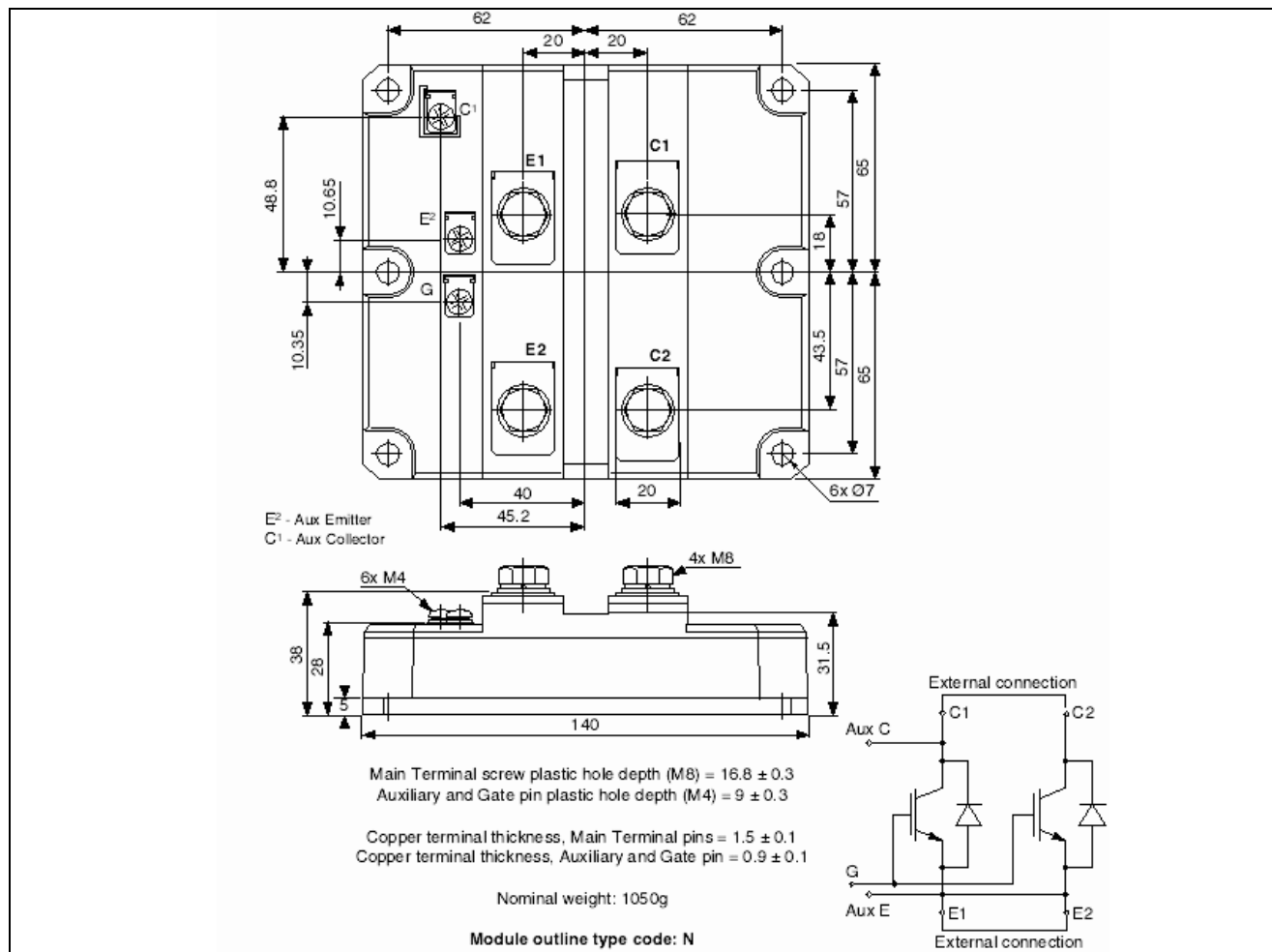


Fig. 10 Transient thermal impedance

PACKAGE DETAILS

For further package information, please visit our website or contact Customer Services. All dimensions in mm, unless stated otherwise.
DO NOT SCALE.



POWER ASSEMBLY CAPABILITY

The Power Assembly group was set up to provide a support service for those customers requiring more than the basic semiconductor, and has developed a flexible range of heatsink and clamping systems in line with advances in device voltages and current capability of our semiconductors.

We offer an extensive range of air and liquid cooled assemblies covering the full range of circuit designs in general use today. The Assembly group offers high quality engineering support dedicated to designing new units to satisfy the growing needs of our customers.

Using the latest CAD methods our team of design and applications engineers aim to provide the Power Assembly Complete Solution (PACs).

HEATSINKS

The Power Assembly group has its own proprietary range of extruded aluminium heatsinks which have been designed to optimise the performance of Dynex semiconductors. Data with respect to air natural, forced air and liquid cooling (with flow rates) is available on request.

For further information on device clamps, heatsinks and assemblies, please contact your nearest sales representative or Customer Services.



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